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(71) Applicant(s)

Daewoo Electronics Co., Ltd.
(Incorporated in the Republic of Korea)
541 5-Ga, Namdaemun-Ro, Jung-Ku, Seoul,
Republic of Korea

(72) Inventor(s)

Hyung-Cheol Kim

(74) Agent and/or Address for Service

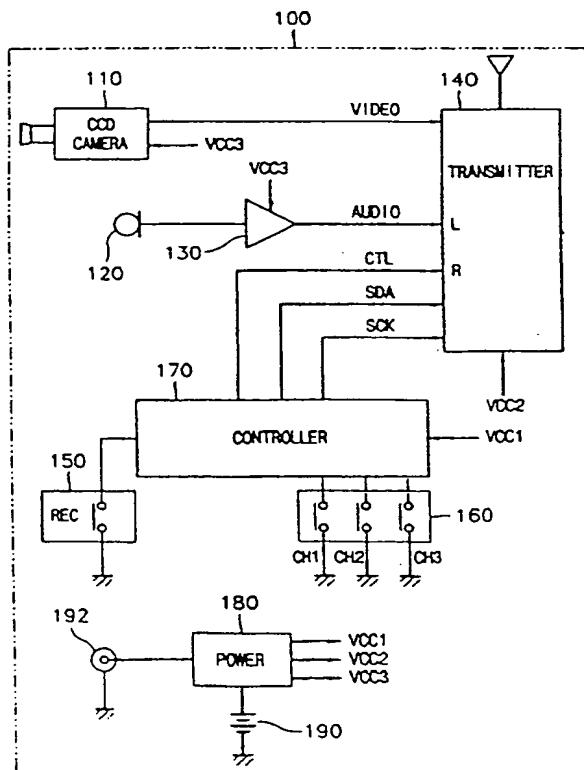
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54 Doughty Street, LONDON, WC1N 2LS,
United Kingdom

(54) Abstract Title

Radio link between camera and recorder

(57) A video camera 110 and a video tape recorder (260, figure 2) capable of transmitting radio signals therebetween is disclosed. The video camera 110 transforms a captured image and sound into video and audio signals receives a remote control signal eg record start generated by a user's operation, frequency-modulates the audio signal onto a first subcarrier and the remote control signal onto a second subcarrier, multiplexes the video signal and the first and second subcarriers, frequency-modulates the multiplexed signal, and transmits the frequency-modulated signal. The video tape recorder tunes to the video carrier after receiving the frequency modulated signal from the video camera, demodulates a baseband signal from the tuned video carrier, separates the baseband signal into the video signal and the first and second subcarriers, demodulates the audio and remote control signals from the separated first and second subcarriers, respectively, and records the video and audio signals on a video tape, responding to the demodulated remote control signal.

FIG. 1



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FIG. 1

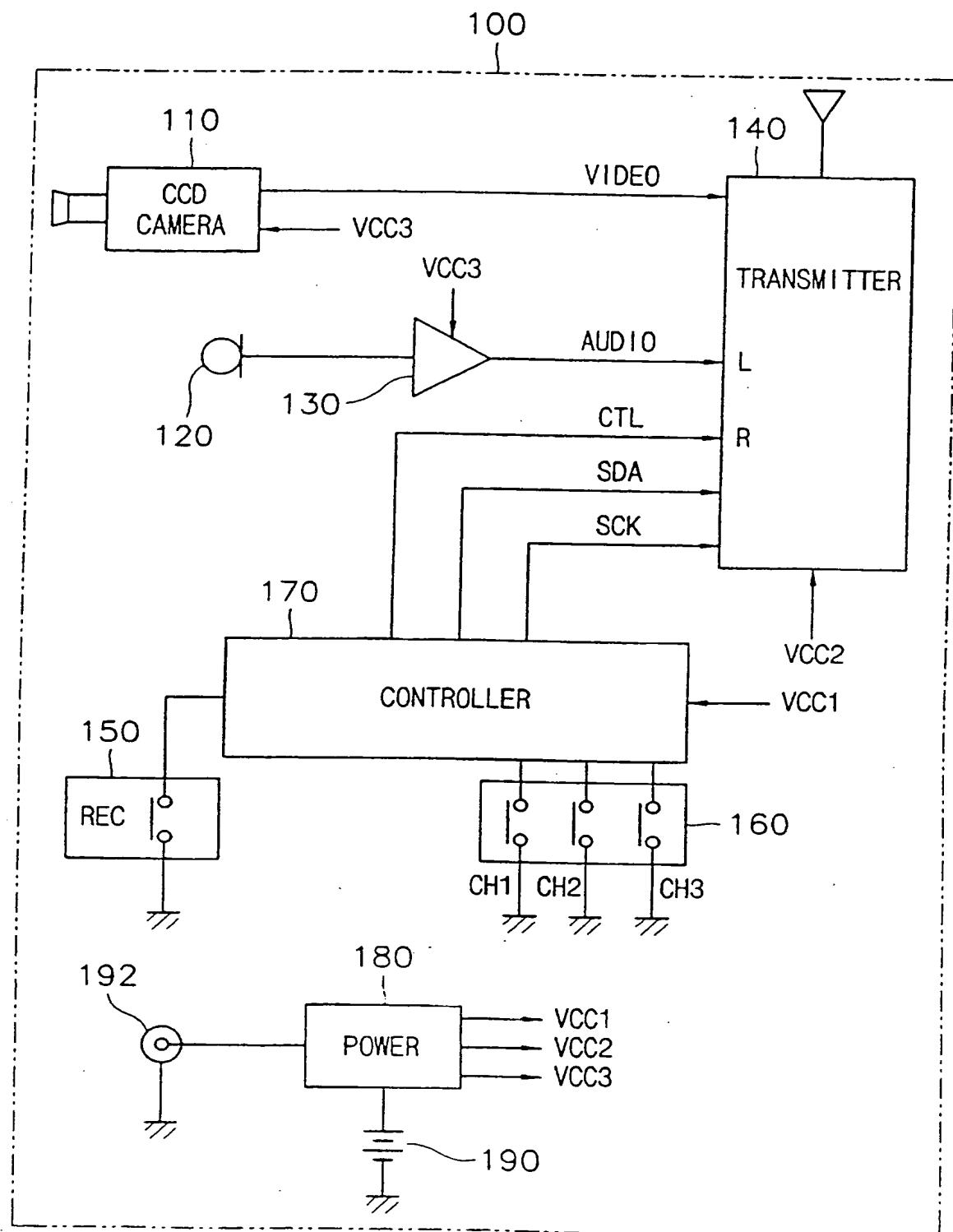


FIG. 2

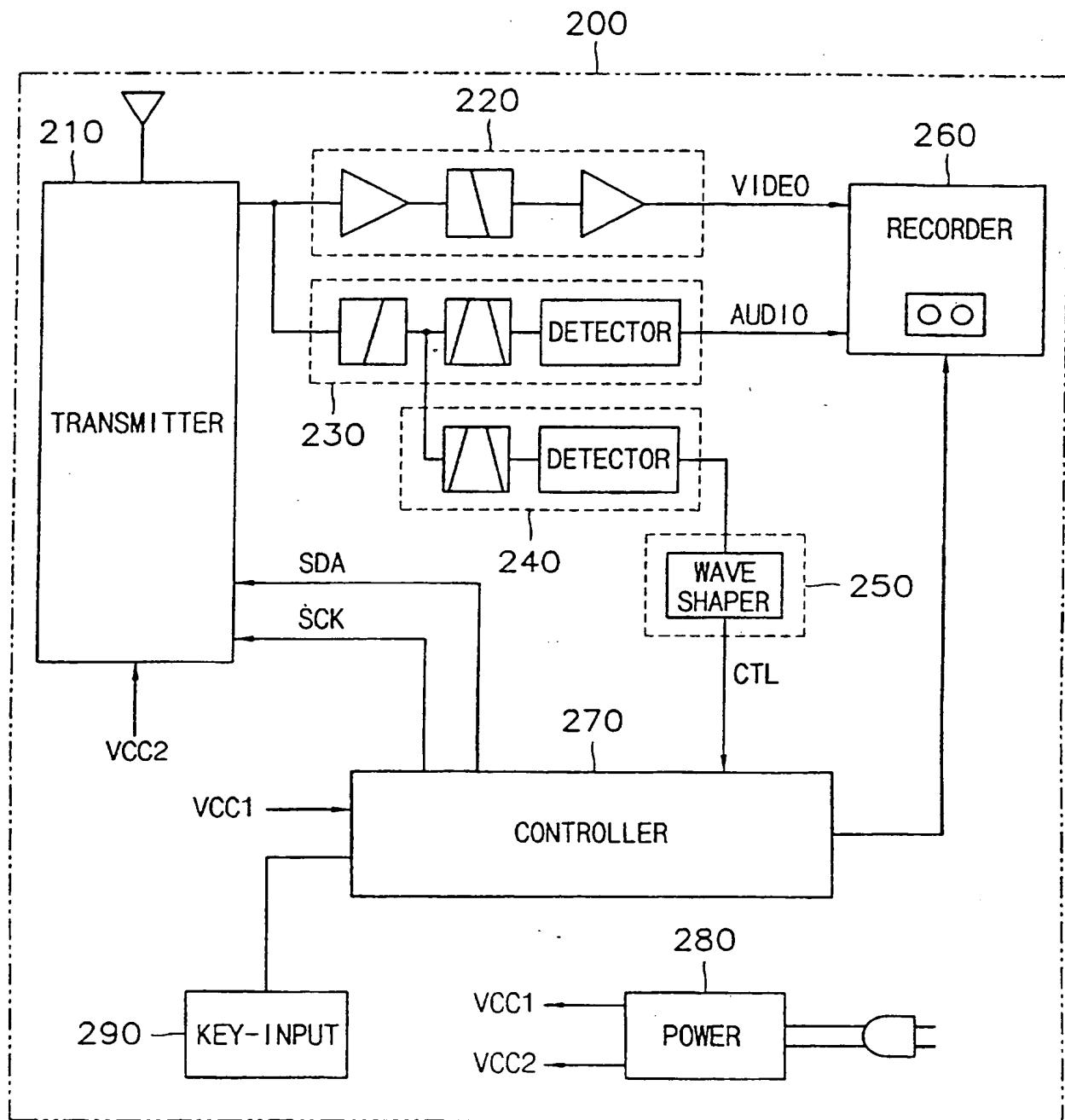
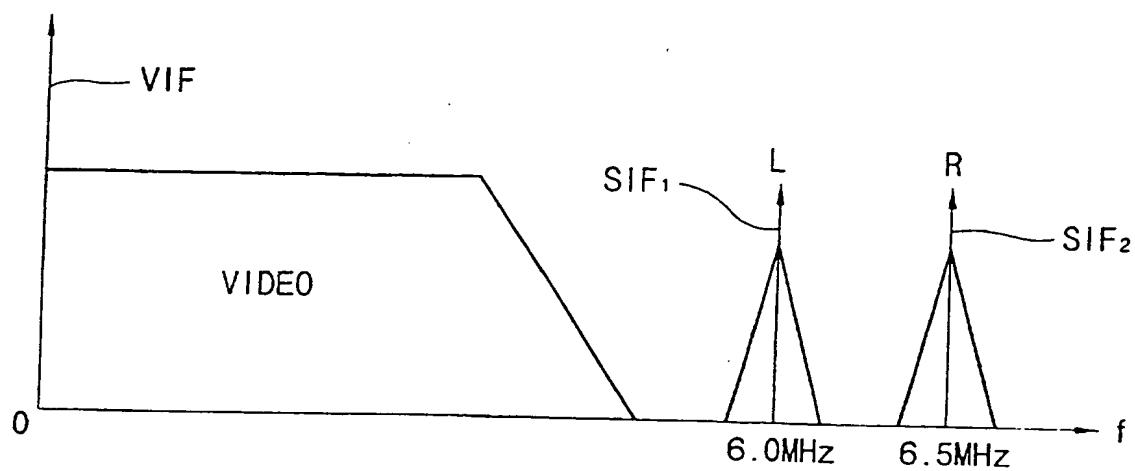


FIG. 3



**VIDEO CAMERA AND VIDEO TAPE RECORDER CAPABLE OF
TRANSMITTING RADIO SIGNAL THEREBETWEEN**

The present invention relates in general to a video camera and a video tape recorder, more particularly, to a video camera and a video tape recorder capable of transmitting in a radio transmission way output signals of the video camera to the video tape recorder to record the output signals in a video tape.

Generally, a video camera combined with a video tape recorder, so called a camcorder, is formed in a body with a video camera for picking up image and sound of an object and with a video tape recorder/reproducer for recording signals of the picked-up image and sound in a video tape and for reproducing the recorded signals in the video tape. A conventional camcorder usually uses an 8 mm video tape rather than an 1/2 inch video tape for a video home system (VHS), as a recording medium. It is impossible for a conventional video tape recorder which uses the 1/2 inch video tape for the VHS to reproduce signals recorded on the 8 mm video tape by the camcorder. In order to reproduce the signals recorded on the 8 mm video tape through a television set, the camcorder has to be connected to the television set by a connection cable and has to supply signals reproduced by a reproducing section of the camcorder through the connection cable to the television set.

For the sake of convenience, a video camera and a video tape recorder capable of transmitting radio signals therebetween has been developed to enable the video camera to transmit video and audio signals recorded in the 8 mm video tape to the video tape recorder not through wire transmission but through radio transmission. The video camera's propagation range of the output signals is limited within a few kilometers to

avoid a harmful influence on public radio signals. Modulation and demodulation of the video and audio signals occur the same as the television set does and these signals are transmitted through a band of an unoccupied television channel.

However, for outdoor photographing work with the video camera, a user has to
5 remote-control the video tape recorder with the video camera since the video camera is separated far away from the video tape recorder.

Meanwhile, Korean patent application laying-open number 85-5200 discloses an art that a key-control signal of the video camera is superimposed on a blanking pulse interval of a video signal to transmit and a receiver detects the key-control signal from
10 the blanking pulse interval of the video signal to perform a corresponding control operation. However, an application of this art to the above system increases design complexity and a cost burden on the grounds that an extra signal processing circuit for superimposing the key-control signal on the blanking pulse interval of the video signal has to be provided to the video camera and that a counterpart circuit for detecting the
15 key-control signal from the blanking pulse interval of the video signal has to be provided to the video tape recorder as well.

Therefore, it is an object of the present invention to provide a video camera paired with a video tape recorder which utilizes existing circuits and which can simply communicate a remote control signal therebetween, by assigning one channel out of
20 audio stereo channels as a channel for a remote control signal.

The above object can be accomplished by the video camera paired with the video tape recorder, which has a video camera section for capturing an image of an object and a sound surrounding the object, for transforming the captured image and sound into video and audio signals, respectively, for receiving a remote control signal generated by a

user's operation, for frequency-modulating the audio signal assigned to a first audio channel onto a first subcarrier, for frequency-modulating the remote control signal assigned to a second audio channel onto a second subcarrier, for multiplexing the video signal and the first and second subcarriers, for frequency-modulating the multiplexed signal, and for transmitting the frequency-modulated signal on a video carrier; and a

5 video tape recording section for tuning the video carrier after receiving the frequency-modulated signal from the video camera section, for demodulating a baseband signal from the tuned video carrier, for separating the baseband signal into the video signal and the first and second subcarriers, for demodulating the audio and remote control signals from

10 the separated first and second subcarriers, respectively, and for recording the video and audio signals in a video tape with responding to the demodulated remote control signal.

The video camera section, which is a hand-held type, has a camera module for capturing the image of the object to output the video signal; a mike for picking up the sound surrounding the object to output the audio signal; a key-input part for generating a

15 key-control signal by a user's key operation; a radio transmitter for receiving the video, audio and remote control signals, for frequency-modulating the audio signal assigned to the first audio channel onto the first subcarrier and the remote control signal assigned to the second audio channel onto the second subcarrier, for multiplexing the video signal and the first and second subcarriers, for frequency-modulating the multiplexed signal onto

20 a video carrier, and for transmitting the frequency-modulated signal through an antenna; and a controlling means for providing the remote control signal to the radio transmitter with responding to the key-control signal and for providing a transmitting channel data of a channel to the radio transmitter.

The video tape recorder has a radio receiver for receiving the frequency-

modulated signal transmitted from the video camera section, for tuning the video carrier, and for demodulating the baseband signal from the tuned video carrier; an extractor for extracting the video signal from the baseband signal; a first audio demodulator for extracting the first subcarrier from the baseband signal and for demodulating the audio signal from the extracted first subcarrier; a second audio demodulator for extracting the second subcarrier from the baseband signal and for demodulating the remote control signal from the extracted second subcarrier; a wave shaper for generating the remote control signal by wave-shaping the demodulated remote control signal; a recorder for recording the video and audio signals in the video tape; and a controller for providing the received channel data to the radio receiver and for controlling the recording means to record the video and audio signals with responding to the remote control signal demodulated by the second audio demodulator.

The above object and other advantages of the present invention will become more apparent by describing in detail preferred embodiments thereof with reference to the attached drawings, in which:

FIG. 1 is a circuit diagram of a radio type video camera according to the embodiment of the present invention;

FIG. 2 is a circuit diagram of a radio type video tape recorder according to an embodiment of the present invention; and

FIG. 3 is a frequency spectrum of multiple signals according to the embodiment of the present invention.

Hereinafter, a preferred embodiment of the present invention will be explained in more detail with reference to the accompanying drawings.

In FIG. 1, a radio type video camera 100 of the present invention includes a

camera module 110, a mike 120, an amplifier 130, a radio transmitter 140, a key-input section 150, a channel setting section 160, a controller 170, a power section 180, and a battery 190, all of which are installed within a hand-held type case.

The camera module 110 has an optical lens section, a solid state pick-up device
5 being a charge coupled device type and a video circuit section, and captures an image of an object and generates a video signal of the captured image.

The mike 120 picks up sound surrounding the object to output an audio signal. This audio signal is amplified by the amplifier 130.

The radio transmitter 140 receives the video signal and a set of the audio signal of
10 left and right channels, that is stereo signals. With reference to the FIG. 3, the audio signal of the left channel is used for frequency-modulating a first subcarrier of 6 MHz, that is, a first sound intermediate frequency (SIF1), the audio signal of the right channel is used for frequency-modulating a second subcarrier of 6.5 MHz , that is, a second sound intermediate frequency (SIF2). The video signal is multiplexed by the first and
15 second subcarriers and the multiplexed signal is frequency-modulated. A bandwidth of 20 MHz is assigned to a channel band of the frequency-modulated signal, and is transmitted on a video carrier of 2.4 GHz, which corresponds to a transmission channel data, through an antenna. Therefore 2.4 Ghz, 2.42Ghz and 2.44 Ghz are assigned to channel bandwidths of channels 1, 2 and 3, respectively.

20 The key-input section 150 has several key switches including a record key and a reproduction key, and generates a key control signal corresponding to a key operation.

The channel setting section 160 has at least one or more channel switches designated as CH1, CH2, and CH3 in FIG.1, and responds to a channel switching operation to generate a channel control signal.

The controller 170 consists of a microcomputer and an accessory circuit thereof, and responds to the key control signal to generate a remote control signal of a sound band frequency. The remote control signal is provided to the radio transmitter 140. The controller 170 provides the radio transmitter 140 with a channel data selected through the channel setting section 160 so that the radio transmitter 140 can generate a channel frequency corresponding to the channel data.

5 The power section 180 has the battery 190 charged with a direct current (DC) power supplied through an DC input terminal 192 so that the battery can output three voltage levels: the VCC1 of 5 V, the VCC2 of 9V and the VCC3 of 12V.

10 Therefore, the radio type video camera of the present invention superimposes the remote control signal of a sound band rather than the sound signal on the right channel between the left and right channels to transmit, so that the remote control signal can be simply transmitted without changing a design of an existing circuit. The audio signal is transmitted only through a mono channel, that is the left channel.

15 Referring to FIG. 2, a radio type video tape recorder 200 includes a radio receiver 200, a video signal extractor 220, a first audio demodulator 230, a second audio demodulator 240, a wave shaper 250, a recorder 270, a power section 280 and a key-input section 290.

20 The radio receiver 210, responding to a channel data (SDA) provided from the controller 270, tunes a video carrier from a received high frequency signal, and demodulates a baseband signal from the tuned video carrier. Here, the channel data of the radio receiver 210 is in advance set the same as a channel data set by the radio type video camera 100.

The video signal extractor 220 firstly amplifies the baseband signal, and extracts

a video signal whose frequency is lower than 60 MHz by filtering the amplified signal.

Secondly, the video signal extractor 220 amplifies the extracted video signal to be provided to the recorder 260.

The first audio demodulator 230 passes only a high frequency component of the baseband signal whose frequency is higher than 6 MHz, filters the high frequency signal to band-pass a signal of 6 MHz band only, and demodulates a first subcarrier signal obtained from a band-pass filter into the audio signal of the left channel, which is provided to the recorder 260, by using a frequency demodulator thereof.

The second audio demodulator 240 passes only a band signal of 6.5 MHz out of the high frequency component, and demodulates a right channel remote control signal from a second subcarrier signal obtained from the band-pass filter by using the frequency demodulator thereof. A wave of the remote control signal is shaped into the remote control signal by the wave shaper 250 and is provided to the controller 270.

Responding to a key-input of the user, the key-input section 290 generates a key control signal and provides the key control signal to the controller 270.

The power section 280 transforms a conventional alternating current (AC) power into DC powers whose operating voltages are 5V (VCC1) and 9V (VCC2).

As described above, in the transmitter of the radio type video camera, not the audio signal but the remote control signal, which has a frequency characteristic of an audio band, is assigned to one channel between the stereo audio channels, that is, left and right channels and is transmitted to the receiver. In the receiver of the radio type video tape recorder, the remote control signal can be demodulated in the same way as the demodulating process of the audio signal by using existing circuits, so that the radio type video tape recorder can receive the remote control signal transmitted from the transmitter

which is far away from the receiver and can perform a control operation directed by the received remote control signal. A production cost can be reduced by the present invention which simply transmits the remote control signal from the transmitter to the receiver by fully utilizing the existing circuits.

5 While the present invention has been particularly shown and described with reference to a particular embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be effected therein without departing from the scope of the invention as defined by the appended claims.

CLAIMS

1. An apparatus for capturing an image of an object and for recording the image in a recording medium, characterized by comprising:

a first means for capturing the image of the object and a sound surrounding the object, for transforming the captured image and sound into video and audio signals,
5 respectively, for receiving a remote control signal generated by a user's operation, for frequency-modulating the audio signal assigned to a first audio channel onto a first subcarrier, for frequency-modulating the remote control signal assigned to a second audio channel onto a second subcarrier, for multiplexing the video signal and the first and second subcarriers, for frequency-modulating the multiplexed signal, and for transmitting
10 the frequency-modulated signal onto a video carrier; and

a second means for tuning to the video carrier after receiving the frequency-modulated signal from the first means, for demodulating a baseband signal from the tuned video carrier, for separating the baseband signal into the video signal and the first and second subcarriers, for demodulating the audio and remote control signals from the separated first and second subcarriers, respectively, and for recording the video and audio signals in a video tape with responding to the demodulated remote control signal.
15

2. The apparatus as claimed in claim 1, characterized in that said first means comprises a means for capturing the image of the object to output the video signal; a means for picking up the sound surrounding the object to output the audio signal; a key-
20 input means for generating a key-control signal by a user's key operation; a radio transmitting means for receiving the video and audio signals and a remote control signal,

for frequency-modulating the audio signal assigned to the first audio channel onto the first
subcarriers and the remote control signal assigned to the second audio channel onto the
second subcarrier, for multiplexing the video signal and the first and second subcarriers,
for frequency-modulating the multiplexed signal onto a video carrier, and for transmitting
5 the frequency-modulated signal through an antenna; and a controlling means for
providing the remote control signal to the radio transmitting means with responding to the
remote control signal, and for providing a transmitting channel data corresponding to a
transmission channel to the radio transmitting means.

3. The apparatus as claimed in claim 1, characterized in that said apparatus
10 further comprises a channel selecting means for selecting one or more channels, and the
controlling means, responsive to the transmission channel selected by the channel
selecting means, for providing the transmitting channel data to the radio transmitting
means.

4. The apparatus as claimed in claim 1, characterized in that said second means
15 comprises a radio receiving means for receiving the frequency-modulated signal
transmitted from the first means, for tuning the video carrier, and for demodulating the
baseband signal from the tuned video carrier; an extracting means for extracting the video
signal from the baseband signal; a first audio demodulating means for extracting the first
subcarrier from the baseband signal and for demodulating the audio signal from the
20 extracted first subcarrier; a second audio demodulating means for extracting the second
subcarrier from the baseband signal and for demodulating the remote control signal from
the extracted second subcarrier; a wave shaping means for generating the remote control

signal by wave-shaping the demodulated remote control signal; a recording means for recording the video and audio signals in the video tape; and a controlling means for providing the received channel data to the radio receiving means, and for controlling the recording means to record the video and audio signals with responding to the remote control signal demodulated by the second audio demodulating means.

5 5. The apparatus as claimed in claim 4, wherein frequencies of the first and second subcarriers are 6 MHz and 6.5 MHz, respectively.

10 6. A video camera, characterized by comprising:
a means for capturing an image of an object to output a video signal;
a means for picking up a sound surrounding the object to output an audio signal;
a key-input means for generating a key-control signal by a user's key operation;
a radio transmitting means for receiving the video and audio signals and a remote control signal, for frequency-modulating the audio signal assigned to a first audio channel onto a first subcarrier and the remote control signal assigned to a second audio channel onto a second subcarrier, for multiplexing the video signal and the first and second subcarriers, for frequency-modulating the multiplexed signal onto a video carrier, and for transmitting the frequency-modulated signal through an antenna; and
15 a controlling means for providing the remote control to the radio transmitting means signal with responding to the key-control signal, and for providing a transmitting channel data of a channel to the radio transmitting means.

20 7. A video tape recorder, characterized by comprising:

a radio receiving means for receiving a high frequency signal, for tuning a video carrier which corresponds to a received channel data, and for demodulating a baseband signal from the tuned video carrier; an extracting means for extracting a video signal from the baseband signal; a first audio demodulating means for extracting a first
5 subcarrier from the baseband signal and for demodulating an audio signal from the extracted first subcarrier; a second audio demodulating means for extracting a second subcarrier from the baseband signal and for demodulating a remote control signal from the extracted second subcarrier; a wave shaping means for generating the remote control signal by wave-shaping the demodulated remote control signal; a recording means for
10 recording the video and audio signals in a video tape; and a controlling means for providing the received channel data to the radio receiving means, and for controlling the recording means to record the video and audio signals with responding to the remote control signal demodulated by the second audio demodulating means.

8. An apparatus for capturing an image of an object and for recording the image
15 in a recording medium, the apparatus constructed and arranged substantially as herein described with reference to or as shown in the accompanying drawing.



Application No: GB 9824880.0
Claims searched: 1 to 8

Examiner: Donal Grace
Date of search: 4 February 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int Cl (Ed.6): G08B 13/194, 13/196 G11B 31/00 H04B 5/00, 7/00, 14/08
H04N 5/765, 5/77, 7/18

Other: EDOC, WPI

Documents considered to be relevant:

| Category | Identity of document and relevant passage | Relevant to claims |
|----------|---|--------------------|
| A | WO 93/01682 A1 (AMSTRAD) | 7 |
| A | US 4400743 (TAKIMOTO et al) | 1 |

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